2016 SUGAR BEET VARIETY TRIALS

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Introduction

The sugar beet industry in southern Idaho and eastern Oregon, in cooperation with Oregon State University (OSU), tests sugar beet varieties at multiple locations each year to identify varieties with high sugar yield and root quality. A seed advisory committee evaluates the data each year and selects the best varieties for sugar production. This report provides the agronomic practices and results for the OSU Malheur Experiment Station sugar beet variety trial at Ontario in 2016.

Materials and Methods

The 2016 sugar beet trials were planted on Owyhee silt loam soil where winter wheat was the previous crop. In the fall of 2015 the wheat stubble was shredded and the field was irrigated and disked. Soil analysis report showed soil pH of 7.3, 3.15% organic material, 6 ppm nitrate-N, 2 ppm ammonium-N, 40 ppm phosphorus, 440 ppm potassium, 12 ppm sulfur (S), 2585 ppm calcium, 642 ppm magnesium, 2.5 ppm zinc (Zn), 1 ppm copper, 8 ppm manganese, 32 ppm iron and 0.5 ppm boron (B). Based on soil analyses and estimated crop needs, the field received 32 lb/acre of nitrogen, 100 lb/acre of phosphate, 500 lb/acre potash, 130 lb/acre of elemental S, 2 lb/acre Zn, and 2 lb/acre B on September 09, 2015. The field was ripped, plowed, and worked down in the fall. The field was bedded to 22-inch beds and 15 gal/acre of Telone® C-17 was shanked into the beds on November 4, 2015.

Sugar beets were planted on March 30, 2016 with the Amalgamated research vacuum plot planter and crew. Plots of each variety are 4 rows wide (22-inch row spacing) by 26 ft long, with a 4-ft alley separating each tier of plots. Each entry is replicated eight times in a randomized complete block design.

On April 11, Counter® 15G was applied in a band over each row at 7.4 lb/acre. The entire trial was broadcast sprayed with Lorsban® on May 5, 2016 for cutworm control. Soil moisture was monitored using Watermark soil moisture sensors (model 200SS, Irrometer Co., Inc., Riverside, CA). Soil moisture is maintained at a soil water tension wetter than 45 centibars (kPa) at 24-inch depth in the beet row for the duration of the season.

The entire trial was broadcast sprayed with Roundup Ultra® at 32 oz/acre on May 12. The spray solution (30 gal/acre) contained 5% ammonium sulfate (AMS) as well as a nonionic surfactant. On June 3 and again on July 7, the trial was broadcast sprayed with Roundup Ultra at 22 oz/acre. The spray solution contained 5% AMS as well as a nonionic surfactant and at an application rate of 30 gal/acre.

At time of thinning *Aphanomyces* (Aph) (a water mold) was confirmed present in the trial. Seedlings were thinned by hand to 1 plant per 7 inches on May 20-21 with the crew paying particular attention to removing any obviously effected plants. On May 27, urea was water run to supply 170 lb nitrogen/acre. Petiole tests were taken on June 21, June 28, and July 6 that showed nutrients within acceptable ranges.

Powdery mildew was controlled by applying Inspire® fungicide at 7 oz/acre plus 5 lb/acre S on July 2 and August 6; Gem® fungicide was applied at 5 oz/acre plus 5 lb S/acre on July 16 and August 20.

Commercial varieties were harvested on October 4, 2016. Experimental varieties were harvested on October 5, 2016. The foliage was flailed and the crowns were removed mechanically with rotating disks. All sugar beets in the center two rows of each plot were dug with a two-row wheel-lifter harvester, weighed, and two seven-beet samples were taken from each plot. Samples were transported daily to the Snake River Sugar factory (Paul, ID) for laboratory analysis of sucrose, nitrate, and conductivity. The root weight data were examined for outliers as is customary for calculations of sugar beet variety data in these trials. Observations more than two standard deviations from the mean for each variety were deleted. The root weights for each plot and the average of the two laboratory samples were used to calculate beet yields and sugar yields. Sugar sample data were checked for errors in sugar percentages and conductivity. Any clearly erroneous sample readings were deleted from the data set.

Sugar concentrations were "factored" by multiplying measured sucrose by 0.98 to compensate for the sugar that would have been lost to respiration if the beets had been stored in a pile. The percent extraction was calculated using the formula:

Ext = 250 + [(1,255.2 · Cond) - (15,000 · Sug) - 6,185] / Sug ∗ (98.66 - 7.845 · Cond) where Ext is percent extraction, Cond is the electrical conductivity in mmho, and Sug is the sucrose concentration in percent.

Variety differences in yield, sucrose content, conductivity, percent extraction, and estimated recoverable sugar were calculated using analysis of variance and comparison of treatment means using protected LSD (0.05). The varieties are listed in the tables of results in descending order of estimated recoverable sugar/acre. Reports of previous years' Oregon State University sugar beet variety trials are available online at www.cropinfo.net.

Results

Variety results were grouped by the estimated recoverable sugar per acre. Root yield for beet varieties in the Commercial Trial averaged 53.60 tared ton/acre and the beets averaged 17.43% sugar content (Table 1). The sugar beet variety in the Commercial Trial with high root yield was Crystal A404NT (59.52 ton/acre) which also had high recoverable sugar/acre (17,879 lb/acre).

Root yield in the Experimental Trial averaged 52.29 tared ton/acre and the beets averaged 17.75% sugar content (Table 2). A sugar beet variety with high root yield was BTS 262 (59.12 ton/acre), which also had high recoverable sugar/acre (17,620 lb/acre).

Table 1. Performance of commercial Roundup Ready® sugar beet varieties in the Amalgamated Sugar Co. LLC Variety Trial at the Oregon State University, Malheur Experiment Station, Ontario, OR, 2016.

Variety	Sugar content	Estimated recoverable sugar[a]			Root yield	Conduc-tivity	Extrac-tion	Curly top ratings		
	%	lb/ton	lb/acre		ton/acre	mmhos	%	2014	2015	2016
Crystal A404NT	17.50	300.5	17879	a	59.52	0.693	85.84	4.9	5.2	5.8
BTS 22RR5N	18.31	316.3	17320	ab	54.75	0.663	86.37	5.3	5.4	6.0
SV RR043N	18.05	310.9	17181	abc	55.25	0.680	86.11	5.3	4.8	5.9
Crystal A399NT	17.26	301.2	17103	abc	56.82	0.578	87.27	5.0	5.7	6.2
BTS 21RR25	17.15	293.7	17073	abc	58.15	0.703	85.64	4.9	5.4	6.0
SX 1521NRR	18.08	312.5	16946	a-d	54.22	0.656	86.43	5.1	4.9	5.5
Crystal A488NT	17.57	299.8	16673	b-e	55.69	0.735	85.30	5.0	5.4	5.9
Crystal RR892	17.45	297.7	16503	b-e	55.44	0.734	85.29	4.8	5.3	-
Crystal RR240NT	17.97	309.2	16457	b-e	53.26	0.684	86.03	5.6	5.3	6.0
Crystal RR933	16.98	291.8	16413	b-f	56.27	0.678	85.93	6.8	6.1	6.7
SV 36106RR	17.47	301.4	16353	b-f	54.26	0.661	86.24	4.7	5.5	-
SV RR044	17.95	311.8	16000	c-g	51.30	0.622	86.84	5.6	5.2	6.1
BTS 27RR20	17.97	306.3	15752	d-g	51.44	0.745	85.24	5.0	4.9	5.8
HM RT9334RR	16.56	284.7	15655	efg	55.05	0.671	85.94	5.1	4.8	5.8
SV 36203NRR	17.67	304.8	15633	efg	51.38	0.665	86.23	5.7	5.3	6.2
BTS 29RR3N	17.31	300.7	15606	efg	51.91	0.611	86.86	5.6	5.9	6.3
Crystal RR275	17.07	285.2	15225	fgh	53.43	0.861	83.53	4.8	5.2	5.7
HM 9295RR	17.05	295.6	15153	gh	51.26	0.623	86.66	4.2	4.8	5.5
HM RT9418RR	16.50	281.9	15000	ghi	53.19	0.711	85.40	4.4	4.9	5.8
HM PM9172RR	16.91	292.0	14894	ghi	51.01	0.645	86.35	4.4	4.8	5.3
HM 9341RR	17.68	310.2	14306	hi	46.13	0.550	87.71	5.6	5.6	6.6
Grand mean	17.43	299.8	16064		53.60	0.679	86.00			
LSD (0.05)	0.35	7.3	1194		4.11	0.049	0.66			

[a]Estimated recoverable sugar amounts followed by different letters are significantly different. If the same letter is shared, the amounts are not statistically different.

Table 2. Performance of experimental Roundup Ready® sugar beet varieties in the Amalgamated Sugar Co. LLC Variety Trial at the Oregon State University, Malheur Experiment Station, Ontario, OR, 2016.

Variety	Sugar content	Estimated recoverable sugar[a]			Root yield	Conduc-tivity	Extrac-tion	Curly top rating	
	%	lb/ton	lb/acre		ton/acre	mmhos	%	2015	2016
BTS 262	17.76	306.7	17621	a	57.45	0.656	86.36	-	5.9
Crystal A631	17.36	295.1	17505	ab	59.35	0.756	84.98	-	6.3
BTS 2564	17.87	304.9	17445	abc	57.23	0.741	85.27	5.1	6.0
BTS 251N	17.70	303.7	16864	a-d	55.56	0.700	85.78	5.4	6.1
BTS 2570	17.76	307.1	16681	a-d	54.32	0.650	86.44	5.4	6.2
SV 36106RR	17.76	305.3	16714	a-d	54.76	0.689	85.94	5.5	-
SV RR157N	17.79	308.5	16651	a-d	54.05	0.629	86.72	5.5	6.3
Crystal A501	18.09	307.2	16637	a-e	54.16	0.770	84.93	5.0	5.6
BTS 2559	17.76	299.8	16532	a-f	55.20	0.804	84.42	5.1	5.8
Crystal A663	17.90	308.7	16512	a-f	53.47	0.668	86.24	-	6.7
Crystal A677	17.90	302.0	16597	a-f	54.92	0.812	84.34	-	5.7
Crystal A680	18.06	313.9	16582	a-f	52.88	0.619	86.89	-	6.1
SX RR1567	17.92	306.0	16508	a-f	53.95	0.734	85.37	-	5.9
SX RR1566	17.56	303.4	16261	a-g	53.65	0.651	86.39	-	6.1
BTS 2523	17.98	305.7	16213	b-g	53.13	0.764	84.99	4.9	5.6
SX RR1555	17.90	308.4	16186	b-g	52.41	0.674	86.16	5.3	6.1
BTS 21RR25	17.68	301.7	16122	c-g	53.40	0.734	85.33	5.4	6.0
BTS 263	17.70	304.5	16080	c-g	52.85	0.685	85.98	-	6.5
SX RR1554N	18.13	311.4	16078	c-g	51.69	0.699	85.87	5.1	5.8
BTS 261	17.72	301.0	16001	d-h	53.13	0.765	84.93	-	5.8
BTS 265	17.97	303.5	15896	d-i	52.41	0.804	84.46	-	5.8
HIL 9885NT	17.54	302.9	15849	d-j	52.27	0.656	86.32	-	6.4
SV RR063	17.92	307.2	15798	d-j	51.51	0.709	85.70	-	5.9
SX RR1565	17.98	310.4	15734	d-k	50.67	0.663	86.31	-	6.2
Crystal RR892	17.55	299.6	15269	e-k	51.03	0.731	85.35	5.3	-
BTS 264	17.31	292.9	15255	f-k	52.08	0.783	84.62	-	6.2
MA609NT	17.33	299.1	15001	g-k	50.16	0.654	86.30	-	6.5
SV RR062	18.33	317.2	14961	g-l	47.19	0.651	86.53	-	6.3
SV RR158	17.79	303.5	14919	g-l	49.14	0.741	85.26	4.9	5.9
HIL 9886	17.62	308.6	14689	h-l	47.60	0.562	87.55	-	7.0
HM 9295RR	17.02	293.5	14534	i-l	49.57	0.657	86.21	4.8	5.5
SV RR061	17.92	310.8	14610	i-l	47.08	0.634	86.68	-	6.5
MA610NT	17.39	301.3	14511	jkl	48.22	0.631	86.62	-	6.8
HIL 9887NT	17.56	306.3	14368	kl	46.91	0.588	87.20	-	6.8
HIL 9888NT	17.56	298.0	13616	l	45.68	0.769	84.84	-	6.6
Grand mean	17.75	304.6	15919		52.29	0.697	85.82		
LSD (0.05)	0.37	7.6	1369		4.48	0.058	0.77		

[a]Estimated recoverable sugar amounts followed by different letters are significantly different. If the same letter is shared, the amounts are not statistically different.